

## ABSTRACT

Road dust is caused by wind entraining fine material from the roadway surface and the main source of Iowa road dust is attrition of carbonate rock used as aggregate.

The mechanisms of dust suppression can be considered as two processes: increasing particle size of the surface fines by agglomeration and inhibiting degradation of the coarse material. Agglomeration may occur by capillary tension in the pore water, surfactants that increase bonding between clay particles, and cements that bind the mineral matter together.

Hygroscopic dust suppressants such as calcium chloride have short durations of effectiveness because capillary tension is the primary agglomeration mechanism. Somewhat more permanent methods of agglomeration result from chemicals that cement smaller particles into a mat or larger particles. The cements include lignosulfonates, resins, and asphalt products. The duration of the cements depend on their solubility and the climate. The only dust palliative that decreases aggregate degradation is shredded shingles that act as cushions between aggregate particles. It is likely that synthetic polymers also provide some protection against coarse aggregate attrition.

Calcium chloride and lignosulfonates are widely used in Iowa. Both palliatives have a useful duration of about 6 months. Calcium chloride is effective with surface soils of moderate fine content and plasticity whereas lignin works best with materials that have high fine content and high plasticity indices.

Bentonite appears to be effective for up to two years and works well with surface materials having low fines and plasticity and works well with limestone aggregate.

Selection of appropriate dust suppressants should be based on characterization of the road surface material. Estimation of dosage rates for potential palliatives can be based on data from this report, from technical reports, information from reliable vendors, or laboratory screening tests. The selection should include economic analysis of construction and maintenance costs. The effectiveness of the treatment should be evaluated by any of the field performance measuring techniques discussed in this report.

Novel dust control agents that need research for potential application in Iowa include; acidulated soybean oil (soapstock), soybean oil, ground up asphalt shingles, and foamed asphalt. New laboratory evaluation protocols to screen additives for potential effectiveness and determine dosage are needed. A modification of ASTM D 560 to estimate the freeze-thaw and wet-dry durability of Portland cement stabilized soils would be a starting point for improved laboratory testing of dust palliatives.

**The opinions, findings and conclusions expressed in this report are those of the authors and not necessarily those of the Project Development Division of the Iowa Department of Transportation or the Highway Research Board**